https://doi.org/10.15218/zjms.2025.080

Prevalence and epidemiological factors of polypharmacy among patients in Erbil city: a cross sectional study

Received: 22/05/2025 Accepted: 15/06/2023

Zhilwan Mahdi Azeez[1*] Abubakir M. Saleh[2,3]

Abstract

Background and objective: Polypharmacy, the concurrent use of five or more medications by a patient**,** is linked to substantial negative outcomes. These include adverse reactions, potentially hazardous drug-drug interactions, mortality, and adherence issues, in addition to cost problems. Finally, the feeling of being overmedicated has been associated with a lower reported quality of life related to health. This study aimed to determine the prevalence of polypharmacy among patients visiting community pharmacy in Erbil city and the association of sociodemographic characteristics with polypharmacy, in addition to measuring the adherence of participants by using the Morisky Medication Adherence Scale (MMA-4).

Methods: During the period from November 2024 to March 2025, a cross-sectional study was conducted in twelve community pharmacies in Erbil city. A multistage cluster sampling method was used in order to collect data from 800 patients who were diagnosed with at least one chronic condition and used medication for at least three months.

Results: Among chronic disease patients, polypharmacy prevalence was 32.5%, and statistical analysis highlighted significant associations between the likelihood of polypharmacy and both the age of the patient and their level of education. However, the same analysis did not reveal a significant connection between a patient's gender and the presence of polypharmacy.

Conclusion: A substantial one-third of Erbil community members with chronic illnesses experience polypharmacy. This rate might be an underestimation, as hospital studies, including more complex cases with multiple conditions and acute needs for various medications, usually report higher figures.

Keywords: Polypharmacy; Community pharmacy; Patient demographic; Morisky medication adherence scale (MMAS-4).

Introduction

The World Health Organization (WHO) defines polypharmacy as the use of five or more medications by a patient, including prescription, over-the-counter, and complementary medicine.(1) Definitive agreement among experts is lacking; the threshold of five or more medications is frequently employed to characterize this practice.(2) According to another study, polypharmacy is characterized by the concurrent use of 5 to 9 medications, while hyper-polypharmacy is defined as the simultaneous use of 10 or more medications.(3) While the concurrent use of multiple medicine**s**, termed appropriate polypharmacy, is sometimes necessary for effective healthcare, it can also lead to unintended adverse outcomes, referred to as inappropriate polypharmacy**.** This involves the use of unnecessary or potentially harmful medications and is

[1] Department of Clinical Pharmacy, College of Pharmacy, Hawler Medical University, Erbil, Kurdistan Region, Iraq.
[2] Department of Community Medicine, College of Medicine, Hawler Medical University, Erbil, Kurdistan Region, Iraq.
[3] Department of Pharmacy, Faculty of Pharmacy, Tishk International University, Erbil, Kurdistan Region, Iraq.
Correspondence: zhilwan.ph175@gmail.com

Copyright (c) The Author(s) 2022. Open Access. This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

https://doi.org/10.15218/zjms.2025.080

especially prevalent among older adults with multiple health conditions, posing significant health risks and creating a substantial financial strain on healthcare systems.[4] As people get older, they often develop multiple long-term health problems, a situation known as multimorbidity (having two or more chronic conditions). Multimorbidity is linked to decreased physical function, higher death rates, poorer quality of life, and greater healthcare utilization. A clear cause-and-effect relationship connects aging, multimorbidity, and the use of multiple medications.[5]

There are many negative consequences associated with polypharmacy, for instance, adverse events, increased morbidity and mortality directly related to excessive consumption of multiple pharmaceutical products, increased cognitive dysfunction and urinary incontinence, and augmented balance problems with associated increased risk for falls. This is truly a frightening collection of negative consequences.[6] In particular, medication adherence has been consistently shown to be lower in those patients in receipt of multiple medications, with the potential consequent risk of reducing the efficacy of treatments. Furthermore, there is evidence that perceived over-medication is associated with poorer reported health-related quality of life.[7] Polypharmacy, the use of multiple medications, elevates the risk of drug-drug interactions (DDIs) in older adults, even with guideline-adherent prescriptions. This is often driven by the increasing prevalence of multiple chronic conditions and care from several providers, affecting about 40% of older outpatients. While DDIs are a frequent danger for this population, effective interventions still need to bedeveloped.[8] Polypharmacy can initiate a harmful cycle where side effects of one medication necessitate additional drugs, thus increasing the overall medication burden. Its symptoms can be easily overlooked, mistaken for normal aging, potentially resulting in incorrect diagnoses and unsuitable treatment. Transitional phases, like hospital discharge or nursing home admission, present heightened risks for medication errors and the onset of polypharmacy.[9] This study is significant because it's the first to investigate polypharmacy prevalence in community pharmacies in Erbil city, thus addressing a critical data gap. By establishing polypharmacy's prevalence and its associations with sociodemographic factors and chronic diseases, this research will provide essential insights to inform and guide future public health interventions in Erbil.

Methods

Study design and setting

This study was undertaken as a descriptive cross-sectional study in community pharmacies in Erbil City, Kurdistan region of Iraq.

Duration of study

The data collection period spanned four months, starting in November 2024 and concluding in March 2025.

Sample size

A sample size was calculated using Epi Info™ version 7.2 based on Erbil's population distribution; according to this calculation, the initial estimated sample size was 768 participants. However, to compensate for possible incomplete data or non-responses and to ensure adequate representation of the data's diversity, the final sample size was increased to 800 participants. A conservative 50% expected participation rate and a 5% margin of error were used, with a design effect of 2 to account for potential clustering.

Inclusion criteria

The study enrolled adult participants (19 years and above) diagnosed with at least one chronic condition and a history of prescribed medication use exceeding three months, visiting selected community pharmacies in Erbil city, polypharmacy defined as a concurrent use of five or more medications.

https://doi.org/10.15218/zjms.2025.080

Exclusion criteria

The study excluded cancer patients due to their unique medication regimens. Pregnant and lactating individuals were also excluded to avoid skewing polypharmacy data with pregnancy-related medication use. Finally, individuals with mental health conditions affecting their ability to provide reliable information or consent were not included.

Sampling method

To achieve a diverse patient sample size, a multistage cluster sampling strategy was employed. Initially, Erbil was stratified into six distinct geographical areas based on municipality. Subsequently, two pharmacies were randomly selected from each area, yielding a total of twelve participating pharmacies out of approximately 500. Finally, patients visiting these pharmacies who presented with at least one chronic condition and had been receiving medication for a period of three months and above were invited to participate in the study. From each of the selected pharmacies, approximately equal number of patients was recruited to participate in the survey. This methodology was designed to ensure geographical representation and encompass a variety of patient experiences across different community pharmacy settings.

Data collection

Data was collected via face-to-face interview using a structured questionnaire covering sociodemographic characteristics (age, gender, marital status, education, employment, and residence), current prescribed medication use, and all chronic conditions that medication was prescribed for. The patient was asked about their degree of satisfaction with cost, and self-reported adverse effects following the administration of prescribed medication were assessed. The Morisky Medication Adherence Scale-4 (MMAS-4) assessed medication adherence, and a license was obtained from professor Morisky. To enhance accuracy, information was cross-checked with family or clarified via phone for patients with incomplete knowledge. This comprehensive approach aimed to explore relationships between patient characteristics, medical conditions, and medication use in Erbil.

Data analysis

Following data collection, information was manually entered into an Excel sheet and then statistical analysis was conducted using SPSS version 26. Initial data cleaning addressed missing or inconsistent entries. Descriptive statistics determined polypharmacy prevalence. Inferential statistics and chi-square tests were used to find associations between sociodemographic factors and polypharmacy.

Ethical approval

The Hawler Medical University ethics committee approved the study, by exact reference number HMU PhEC 03102024-38, Participating pharmacies provided informed written consent, while individual participants gave verbal consent after receiving comprehensive details about the research's goals, procedures, potential risks and benefits, and their right to withdraw, ensuring voluntary and knowledgeable participants.

Results

According to Table 1, this current study engaged 800 individuals in total. With a mean age of 60.59 ± 12.82 years, the vast majority (n = 423, 52.9%) were over 60. In comparison with men (n = 345, 43.1%), women made up a larger percentage (n = 455, 56.9%). Almost fifty percent of those who participated (n = 395, 49.4%) were illiterate, while 25.4% (n = 203) held graduate degrees. The majority were housewives (n = 389, 48.6%), followed by government employees (n = 135, 16.9%), based on employment status. The majority of participants got married (n = 704, 88.0%) and resided in cities (n = 661, 82.6%).

https://doi.org/10.15218/zjms.2025.080

Table 1 Sociodemographic characteristic of the patients

variable	Characteristics n=800	F	%
Age (year)	19-30	17	2.1
	31-40	27	3.4
	41-50	121	15.1
	51-60	212	26.5
	Above 60	432	52.9
	Mean ± SD	60.59 ±	12.82
Gender	Male	345	43.1
	Female	455	56.9
Employment status	Unemployed	55	6.9
	Government-employed	135	16.9
	Privet-employed	50	6.3
	housewife	389	48.6
	student	7	.9
	retired	132	16.5
	Self-employed	32	4.0
Marital status	single	34	4.3
	married	704	88.0
	divorced	1	0.1
	widowed	61	7.6
Residence	urban	661	82.6
	suburban	74	9.3
	rural	65	8.1
Education level	Illiterate	395	49.4
	primary	106	13.3
	secondary	85	10.6
	College\institute	11	1.4
	postgraduate	203	25.4

Note: F=frequency, % = percentage, SD = Standard Deviation.

https://doi.org/10.15218/zjms.2025.080

Table 2 demonstrate prevalence of polypharmacy, out of 800 patients which participated in this study, 67.5% (n = 540) had no polypharmacy, while 32.5% (n = 260) had polypharmacy, with a mean polypharmacy score of 2.30 ± 1.87. In terms of prescribing sources, 30.3% (n = 242) reported having medications prescribed by four or more physicians, and 22.5% (n = 180) were unsure of the number of prescribers.

Significant correlations between the participants' degrees of polypharmacy and a number of demographic traits were shown in Table 3.

The rate of polypharmacy was highest among those over 60 (37.4%), and age and polypharmacy were significantly correlated (χ^2 = 17.81, *P* <.001). Also, there was additionally a significant correlation between polypharmacy and educational achievement (χ^2 = 18.69, *P* <.001), and the level of taking multiple medicines was higher among those with no formal education (39.0%) than among those with a higher level of education. There was also a significant correlation between polypharmacy and occupation, with a higher prevalence of polypharmacy between those who were unemployed (50.9%) and retirement (40.2%) compared to those in other employment categories (χ^2 = 38.18, *P* <.001). Moreover, polypharmacy and marital status were significantly correlated (χ^2 = 8.92, *P* = 0.03), with widowers (44.3%) and singles (44.1%) having greater participation rates. Residence was significantly associated with polypharmacy (χ^2 = 30.73, *P* < 0.001), where participants living in suburban (52.7%) and rural (52.3%) areas exhibited higher rates of polypharmacy than those residing in urban areas. In contrast, gender was not statistically significantly associated with polypharmacy (*P* = 0.35).

Table 2 Level of polypharmacy and number of prescribers (n = 800)

Variable	Characteristic n=800	F	%
Polypharmacy level	No polypharmacy	540	67.5
	Polypharmacy	260	32.5
	Mean ± SD	2.30 ±	1.87
Number of prescribing physicians	1 physician	208	26.0
	2-3 physicians	170	21.3
	4 or more physicians	242	30.3
	Not sure	180	22.5

Note: F = Frequency, % = Percentage, Sd= Standard Deviation

https://doi.org/10.15218/zjms.2025.080

Table 3 Association between demographic characteristics and polypharmacy levels among patients (n=800)

Demographic Information	Categories	Polypharmacy Level		N	*P* value
		No Polypharmacy No. (%)	Polypharmacy No. (%)		
Age (year)	19-30	10 (58.8)	7 (41.2)	17	<0.001
	31-40	21 (77.8)	6 (22.2)	27	
	41-50	99 (81.8)	22 (18.2)	121	
	51-60	145 (68.4)	67 (31.6)	212	
	Above 60	265 (62.6)	158 (37.4)	423	
Gender	Male	239 (69.3)	106 (30.7)	345	0.35
	Female	301 (66.2)	154 (33.8)	455	
Educational level	Illiterate	241 (61.0)	154 (39.0)	395	<0.001
	Primary	83 (78.3)	23 (21.7)	106	
	Secondary	58 (68.2)	27 (31.8)	85	
	College/Institute	10 (90.9)	1 (9.1)	11	
	Postgraduate	148 (72.9)	55 (27.1)	203	
Employment status	Unemployed	27 (49.1)	28 (50.9)	55	<0.001
	Government-employed	114 (84.4)	21 (15.6)	135	
	Private-employed	39 (78.0)	11 (22.0)	50	
	Housewife	249 (64.0)	140 (36.0)	389	
	Student	6 (85.7)	1 (14.3)	7	
	Retired	79 (59.8)	53 (40.2)	132	
	Freelance/Self-employed	26 (81.3)	6 (18.8)	32	

Note: F = Frequency, % = Percentage; Sd= Standard Deviation, significance was set at *P* <.001, and Chi-Square was used.

https://doi.org/10.15218/zjms.2025.080

Hypertension (n = 185, 23.1%) was among the most frequently identified health issues for which medicine was provided, followed by dyslipidemia (n = 135, 16.9%) and diabetes (n = 122, 15.3%), according to Table 4. Autoimmune diseases (n = 17, 2.1%) and hyperthyroidism (n = 11, 1.4%) were less commonly reported ailments. Among polypharmacy patients specifically (n = 260), hypertension (23.8%), dyslipidemia (17.7%), and diabetes (16.2%) remained the most prevalent conditions.

Regarding the duration since diagnosis, nearly half of the participants (47.3%, n = 378) had been living with a chronic condition for over nine years, while 21.8% (n = 174) had been diagnosed for 3–6 years. Regarding healthcare-seeking behavior, the majority of individuals (n = 466, 58.3%) reported usual visits every three months, whereas 16.5% (n = 132) and 11.1% (n = 89) indicated normal visits on a six-month basis.

Table 4 Distribution of medical condition characteristics among patients (n = 800)

Questions	Responses	F	%
Medical Conditions for Which Participants Are Prescribed Medications (Multiple Responses Allowed)	Hypertension	528	66.1
	Diabetes	359	44.9
	Heart disorder	323	40.4
	Dyslipidemia	177	22.2
	Chronic kidney disorder	70	8.8
	Hypothyroidism	55	6.9
	Neurological disease	45	5.6
	Chronic respiratory disorder	24	3
	Prostate enlargement	11	1.4
	Hyperthyroidism	9	1.1
	Autoimmune disorders	5	0.6
	Gout	4	0.5
Conditions for which medications are prescribed in polypharmacy patients N=260 (Multiple Responses Allowed)	Hypertension	201	77.6
	Heart disorder	181	69.9
	Diabetes	132	51
	Dyslipidemia	65	25.1
	Chronic kidney disorder	52	20.1
	Hypothyroidism	23	8.9
	Neurological disease	22	8.5
	Chronic respiratory disorder	9	3.5
	Prostate enlargement	9	3.5
	Hyperthyroidism	4	1.5
	Gout	4	1.5
	Autoimmune disorders	3	1.2
Duration since chronic condition diagnosis	3 to 6 months	25	3.1
	6 to 9 months	15	1.9
	1 to 3 years	100	12.5
	3 to 6 years	174	21.8
	6 to 9 years	108	13.5
	9 years and above	378	47.3
Frequency of healthcare provider visits	Every 3 months	132	16.5
	Every 6 months	89	11.1
	Nearly once a year	58	7.2
	Only as needed	466	58.3
	Other	55	6.9

https://doi.org/10.15218/zjms.2025.080

Table 5 demonstrates satisfaction with the cost of medication, 39.8% (n = 318) expressed dissatisfaction, 38.6% (n = 309) reported neutrality, and 21.6% (n = 173) were satisfied. About self-reported adverse effects, 54.5% (n = 436) of participants experienced adverse effects, in contrast, 10.8% (n = 86) were not sure about whether they experienced the adverse effects in addition to the adverse effects being due to the disease or due to medication that was prescribed to manage chronic disease. In addition, 81% (n = 353) reported that the adverse effects interfered with daily activities, in contrast to 19% (n = 83), who reported no interference with daily activities.

Table 6 revealed that a large proportion of participants (n = 572, 71.5%) reported forgetting to take their medications, and nearly one-third (n = 256, 32.0%) acknowledged having problems remembering to take them. Additionally, 36.9% (n = 295) admitted to stopping their medications when they felt better, and 27.1% (n = 217) discontinued use when feeling worse. Self-reported adherence levels by using Morisky medication adherence scale, was predominantly moderate (n = 421, 52.6%), followed by low adherence (n = 197, 24.6%) and high adherence (n = 182, 22.8%).

Table 5 Cost satisfaction and self-reported adverse effect (n=800)

Questions	Responses	F	%
Satisfaction with the cost of medication	Satisfied	173	21.6
	Neutral	309	38.6
	Dissatisfied	318	39.8
Experienced adverse effects	Yes	436	54.5
	No	278	34.8
	Not sure	86	10.8
Did adverse effects interfere with daily activities? N=436	Yes	353	81.0
	No	83	19.0

Table 6 Morisky medication adherence scale (MMAS-4), used to assess medication-taking behaviors among patients (n = 800)

Questions	Responses	F	%
Do you ever forget to take your medicine?	No	228	28.5
	Yes	572	71.5
Do you ever have problems remembering to take your medication?	No	544	68.0
	Yes	256	32.0
Do you stop taking medications when you feel better?	No	505	63.1
	Yes	295	36.9
Do you stop taking medications when you feel worse?	No	583	72.9
	Yes	217	27.1

https://doi.org/10.15218/zjms.2025.080

Discussion

The present study, encompassing 800 participants, done in community pharmacy, found the prevalence of polypharmacy to be 32.5%. In comparison, a descriptive cross-sectional study conducted in Baghdad, Iraq, in 2023 by Talib and Anwer assessed polypharmacy prevalence through face-to-face interviews in nursing home and community settings. Defining polypharmacy as the concurrent use of five or more medications, the study determined a prevalence of 45.5% among the surveyed individuals.[10] The higher prevalence of polypharmacy in the study may be due to its methodology, which included both nursing home and community residents, thus capturing a wider range of medication use compared to studies focused on only one setting. Moreover, Mijk et al. conducted a retrospective, cross-sectional analysis at Azadi Hospital in Duhok City, Kurdistan Region, examining records of 373 patients aged 50 years or older. This study defined polypharmacy as the use of five or more medications and reported a polypharmacy rate of 41.55% at the time of the patients' initial hospital entry, which subsequently increased to 58.98% during their hospitalization.[11] However, a retrospective dynamic cohort study utilizing a primary healthcare database that encompassed 68,426 community-dwelling adults aged 40 years and older in the Flemish region between 2011 and 2015 was done by Hellemans et al. Revealed a polypharmacy prevalence of 29.5%, where polypharmacy was defined as the concurrent use of 5 to 9 medications.[12] Regarding sociodemographic characteristics, the current study confirmed that advanced age showed a statistically significant link with polypharmacy, with the highest rate (37.4%) noted among those over the age of 60. In addition, educational level was also significantly related to polypharmacy, with higher rates of polypharmacy among illiterate participants (39.0%) compared to those with higher education levels.

Moreover, in 2019 cross-sectional analysis of data from the latest Brazilian National Health Survey, done by Ramos et al. Encompassing 22,681 participants, it established a distinct positive relationship between increased age and the prevalence of polypharmacy. The occurrence of polypharmacy rose from 15.1% in the 60-69 age bracket to 28.1% in individuals aged 80 and above. After statistical adjustment, the odds of polypharmacy were significantly elevated in the 70-79 and 80+ age demographics compared to the 60-69 age group. Furthermore, diminished educational achievement, specifically incomplete or complete primary education (20.8% and 20.2%, respectively), correlated with higher polypharmacy rates, with adjusted analysis indicating a greater probability relative to those without formal education.[13]

Moreover, a preliminary analysis of baseline data (n=9, 412) from the Brazilian Longitudinal Study of Aging (ELSI-Brazil), conducted by Seixas et al. A cross-sectional study representing the Brazilian population aged 50 and older revealed a notable positive correlation between age and polypharmacy prevalence. The prevalence increased from 8.0% in the 50-59-year-old age group to 29.4% in individuals over 80 years of age. Furthermore, the study indicated a statistically significant association between educational attainment and polypharmacy; generally, individuals with more years of schooling exhibited a lower prevalence of polypharmacy, although a strictly linear pattern was not observed.[14] In contrast, a descriptive cross-sectional investigation conducted in Baghdad, Iraq, in 2023 demonstrated a statistically significant positive correlation between the probability of polypharmacy and increasing age (P = 0.002). Conversely, no significant association was observed between the likelihood of polypharmacy and the educational attainment of the participants (P = 0.436).[10] Conversely, sex did not demonstrate a statistically significant

https://doi.org/10.15218/zjms.2025.080

relationship with the presence of polypharmacy in this group of patients. However, between 1999 and 2018, a US-based cross-sectional study using the National Health and Nutrition Examination Survey data across ten cycles examined polypharmacy, defined as the concurrent use of five or more medications. The study done by Vennu, which included all adults aged 18 and older, found that polypharmacy was particularly prevalent among women (55.1%).[15] In contrast systematic review and meta-analysis, prospectively registered on PROSPERO and adhering to PRISMA guidelines, conducted in 2022 by Delara et al., identified 106 full-text articles, with a primary focus on 54 studies that defined polypharmacy as the use of all medications. This comprehensive analysis found no significant associations between sex and prevalence of polypharmacy across the included studies.[4] Meanwhile, this study's focus on chronic disease patients and community pharmacy settings might not fully represent polypharmacy prevalence, especially in acutely or severely ill individuals typically seen in hospitals. Additionally, self-reported data introduces potential bias, and language or cultural factors could affect the accuracy of results.

Conclusion

A study carried out in Erbil, located in the Kurdistan Region of Iraq, found that 32.5% of individuals receiving treatment for chronic illnesses over a period of at least three months were taking five or more medications simultaneously, indicating a notable rate of polypharmacy. The analysis showed that both age and level of education had a significant link to polypharmacy, whereas no meaningful correlation was identified between gender and the condition.

Competing interests

The authors declare that they have no competing interests.

References

1. World Health Organization. Medication safety in polypharmacy. Geneva: World Health Organization; 2019. (Accessed May 14, 2025, at https://www.who.int/docs/default-source/patient-safety/who-uhc-sds-2019-11-eng.pdf).
2. Guillot J, Maumus-Robert S, Bézin J. Polypharmacy: a general review of definitions, descriptions and determinants. Therapies. 2020; 75(5):407–16. https://doi.org/10.1016/j.therap.2019.10.001.
3. Bhagavathula AS, Vidyasagar K, Chhabra M, Rashid M, Sharma R, Bandari DK, et al. Prevalence of polypharmacy, hyper polypharmacy and potentially inappropriate medication use in older adults in India: a systematic review and meta-analysis. Front Pharmacol. 2021; 12:685518. https://doi.org/10.3389/fphar.2021.685518.
4. Delara M, Murray L, Jafari B, Bahji A, Goodarzi Z, Kirkham J, et al. Prevalence and factors associated with polypharmacy: a systematic review and meta-analysis. BMC Geriatr. 2022; 22(1):601. https://doi.org/10.1186/s12877-022-03279-x.
5. Daunt R, Curtin D, O'Mahony D. Polypharmacy stewardship: a novel approach to tackle a major public health crisis. Lancet Healthy Longev. 2023; 4(4):e228–35. https://doi.org/10.1016/S2666-7568(23)00036-3.
6. Alpert JS. Polypharmacy in elderly patients: the march goes on and on. Am J Med. 2017; 130(8):875–6. https://doi.org/10.1016/j.amjmed.2017.03.012.
7. Masnoon N, Shakib S, Kalisch-Ellett L, Caughey GE. What is polypharmacy? A systematic review of definitions. BMC Geriatr. 2017; 17(1):230. https://doi.org/10.1186/s12877-017-0621-2
8. Weng YA, Deng CY, Pu C. Targeting continuity of care and polypharmacy to reduce drug–drug interaction. Sci Rep. 2020; 10(1):21279. https://doi.org/10.1038/s41598-020-78236-y.
9. Varghese D, Ishida C, Patel P, Haseer Koya H. Polypharmacy. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2024.
10. Talib H, Anwer ZM. Prevalence of polypharmacy among older adult patients in Baghdad: a descriptive study. AIP Conf Proc. 2023; 2977 (1):040008. https://doi.org/10.1063/5.0181861.
11. Mijk KN, Alyas KH, Haji MH, Ali WK, Mohammad FK. Evaluation of first hospital entry and hospitalization related prescription polypharmacy targeting patients of fifty years old and more at a general hospital, Duhok, Iraq: Polypharmacy in elderly patients. J Ideas Health. 2024; 7(3):1081–6. https://doi.org/10.47108/jidhealth.Vol7.Iss3.348.
12. Hellemans L, Nuyts S, Hias J, van den Akker M, Van Pottelbergh G, Rygaert X, et al. Polypharmacy and excessive polypharmacy in

community-dwelling middle aged and aged adults between 2011 and 2015. Int J Clin Pract. 2021; 75(1):e13942. https://doi.org/10.1111/ijcp.13942.
13. Ramos KA, Boing AC, Andrade JM, Bof de Andrade F. Polypharmacy among older adults in Brazil: Association with sociodemographic factors and access to health services. Dialogues Health. 2022; 1:100078. https://doi.org/10.1016/j.dialog.2022.100078.
14. Seixas BV, Freitas GR. Polypharmacy among older Brazilians: prevalence, factors associated, and sociodemographic disparities (ELSI-Brazil). Pharm Pract (Granada). 2021; 19(1):2168. https://doi.org/10.18549/pharmpract.2021.1.2168.
15. Vennu V. Polypharmacy is associated with sociodemographic factors and socioeconomic status in United States adults. Pharmacy (Basel). 2024; 12(2):49. https://doi.org/10.3390/pharmacy12020049.